

Page 1, line 1, ~~delete~~ the heading "SPECIFICATION"

Page 1, line 3, ~~delete~~ the recitation "- o -"

Page 1, line 4, ~~amend~~ the section heading, as follows:

BACKGROUND OF THE INVENTION

Page 1, line 5, ~~add~~ section subheading --Field of the Invention-- prior to the start of the paragraph beginning "The present invention relates to a method"

Page 1, line 14, ~~add~~ section subheading --Description of the Related Art-- prior to the start of the paragraph beginning "Manufacture of tires for vehicle wheels"

Page 1, lines 20-25, ~~amend~~ the paragraph, as follows:

Applied to the carcass structure, at a circumferentially-external position thereof, is a belt structure comprising one or more belt strips in the form of a closed ring, essentially consisting of textile or metal cords suitably oriented relative to each other and to the cords belonging to the underlying carcass plies.

Page 2, lines 5-8, ~~amend~~ the paragraph, as follows:

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D2

In accordance with traditional production methods, essentially the above-listed tire components are first made separately from each other to be then assembled during a tire-manufacturing step.

Page 2, lines 27-35, ~~amend~~ the paragraph, as follows:

D3

For example, U.S. Patent No. 5,453,140, herein quoted as an example of the pertinent art, discloses a method and an apparatus according to which the carcass structure is formed by laying down a single continuous thread according to alternating deposition paths placed consecutively in side-by-side relationship in a circumferential direction, onto a toroidal support having a shape corresponding to the inner shape of the tire to be made.

Page 2, line 36 - page 3, line 5, ~~amend~~ the paragraph, as follows:

D4

In more detail, the toroidal support is previously coated with a raw-rubber layer having a dual function, i.e., that of conveniently adhering to the deposited thread so as to hold the individual deposition sections thereof at a fixed positioning, and that of forming an air-proof inner liner in the finished tire.

Page 3, lines 22-28, ~~amend~~ the paragraph, as follows:

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D5

At the instant intervening between formation of a deposition section and formation of the subsequent deposition section, the toroidal support is rotated through a predetermined angular pitch, making the apparatus ready for formation of a new deposition section disposed circumferentially in side-by-side relationship with the previously deposited section.

Page 4, lines 10-16, ~~amend~~ the paragraph, as follows:

D6

Within the scope of the carcass structure manufacture, as can be learned from Patents EP 0,664,231 and EP 0,664,232, the deposition sections formed by the individual thread-like element are also provided to be placed in an alternated sequence at axially-opposite positions relative to one or more annular anchoring elements constituting said bead cores.

Page 4, line 26 - page 5, line 12, ~~amend~~ the paragraph, as follows:

D7

In more detail, the invention relates to a method of making a tire for vehicle wheels, wherein manufacturing of the carcass structure involves formation of at least one carcass ply by the following steps: preparing at least one continuous strip-like element comprising a plurality of longitudinal and parallel thread-like elements at least partly coated with at least one layer of raw elastomer material; depositing the strip-like element onto a toroidal support in alternated deposition sections each extending according to a substantially U-shaped conformation about the profile in transverse section of the toroidal support, to define two side portions substantially extending in planes orthogonal to a geometric axis of rotation of the toroidal support at mutually

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D7
spaced apart positions in an axial direction, and a crown portion extending in a radially-external position between the side portions, the crown portions of each deposition section being disposed consecutively in side-by-side relationship along the circumferential extension of the toroidal support, whereas the side portions of each deposition section are each partly overlapped with a side portion of at least one consecutive deposition section.

Page 5, lines 13-16, ~~amend~~ the paragraph, as follows:

D8
In more detail, the side portions in mutual-overlapping relationship are caused to mutually converge toward the geometric axis of rotation of the toroidal support.

Page 5, lines 27-31, ~~amend~~ the paragraph, as follows:

D9
In a preferential solution, the individual deposition sections are sequentially laid down onto the toroidal support according to a circumferential distribution pitch corresponding to the width of the strip-like element.

Page 7, lines 15-23, amend the paragraph, as follows:

D10
This retaining step of the strip-like element is, for example, carried out by disposing a retaining element alongside the second side portion after translation of the distributor element radially close to the geometric axis of rotation of the toroidal support, so that the strip-like

D10
element is turned back about the retaining element, thereby forming the bending region as a result of translation of the distributor element radially away from the geometric axis of rotation of the toroidal support.

Page 9, lines 22-27, ~~amend~~ the paragraph, as follows:

D11
Application of the belt structure preferentially further comprises the step of forming at least one second belt strip by winding of at least one continuous thread-like element in coils disposed axially in side-by-side relationship and extending circumferentially about the first belt strip.

Page 9, lines 28-34, ~~amend~~ the paragraph, as follows:

D12
If required, the winding coils formed by the elongated element can be disposed mutually in side-by-side relationship according to a variable axial-distribution pitch, which is, for example, greater close to the equatorial median plane of the toroidal support relative to the opposite side edges of the belt structure.

Page 12, lines 27-30, ~~amend~~ the paragraph, as follows:

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- D13*
- Fig. 18 is a fragmentary perspective view in section showing the tire in reference provided with an inextensible annular structure made in accordance with an alternative embodiment of the invention; and

Page 12, lines 31-33, ~~amend~~ the paragraph, as follows:

- D14*
- Fig. 19 is a transverse half-section showing a tire in accordance with the invention mounted on a respective rim and in a condition of slip run.

Page 12, line 34, ~~amend~~ the section heading, as follows:

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Page 13, lines 20-25, ~~amend~~ the paragraph, as follows:

D15

The carcass structure 2 may possibly be coated, on its inner walls, with an air-proof elastomer-material layer 10, i.e., a so-called "liner", essentially consisting of a layer of elastomer material impervious to air, adapted to ensure the hermetic seal of the inflated tire.

Page 13, lines 26-31, ~~amend~~ the paragraph, as follows:

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D16

Assembling of the above-listed components, as well as production of one or more of said components, takes place with the aid of a toroidal support 11, diagrammatically shown in Figs. 2 and 3, having the same configuration as the inner walls of the tire to be manufactured.

Page 14, lines 14-23, ~~amend~~ the paragraph, as follows:

D17

This liner 10 can be advantageously made by circumferentially winding about the toroidal support 11 at least one ribbon-like band 12 of air-proof elastomer material, produced from an extruder and/or a calender located close to the toroidal support itself. As viewed from Fig. 1, winding of the ribbon-like band 12 substantially takes place in circumferential coils disposed consecutively in side-by-side relationship to follow the profile in transverse section of the outer surface of the toroidal support 11.

Page 14, line 31 - page 15, line 7, ~~amend~~ the paragraph, as follows:

D18

Concurrently with winding of the ribbon-like band 12, application of a pair of auxiliary annular elements 12a can be carried out close to the inner circumferential edges of the carcass structure during its manufacturing step. Each of these auxiliary annular elements 12a can be obtained, for example, by winding the ribbon-like band 12 in a coil disposed axially side-by-side with the corresponding coil located at the inner perimetric edge of liner 10 defined or to be defined on the toroidal support 11. Alternatively, the auxiliary annular elements 12a can be

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D18
made up of at least one auxiliary ribbon-like band obtained from a respective extruder located at the toroidal support 11.

Page 16, line 29 - page 17, line 6, ~~amend~~ the paragraph, as follows:

D19
The deposition apparatus 18 essentially comprises first guide members 19, consisting, for example, of a pair of rollers borne on stationary rotation axes, arranged to engage the continuous strip-like element 13 produced by the extruder 15. Downstream of the first guide members 19, the strip-like element 13 comes into engagement with second guide members 20 consisting of further rollers, for example, mounted on a movable carriage 21 reciprocating in a direction oriented transversely to the equatorial plane X-X of the toroidal support 11. Slidably linked to the movable carriage 21, in a direction substantially perpendicular to the movement direction of the carriage itself, is at least one distributor element 22 consisting of a further roller, for example.

Page 17, lines 13-19, ~~amend~~ the paragraph, as follows:

D20
By a combination between the transverse movement of movable carriage 21 and radial movement of the distributor element 22, the distributor element lends itself to be translated by a reciprocating motion along a trajectory "t" extending according to a substantially U-shaped conformation about the profile in transverse section of the toroidal support 11.

Page 18, lines 2-8, ~~amend~~ the paragraph, as follows:

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D21

For convenience in description, the deposition sections obtained as a result of a translation from right to left of the distributor element 22, with reference to Figs. 2 and 3, will be hereinafter referred to as first deposition sections 23. Those obtained from translation of the distributor element in the opposite direction will be, instead, identified as second deposition sections 24.

Page 19, lines 27-32, ~~amend~~ the paragraph, as follows:

D22

In the embodiment diagrammatically shown in Fig. 1, where the circumferential distribution pitch of the individual deposition sections 23, 24 corresponds to the width of the strip-like element 13, the angular-rotation pitch of the toroidal support 11 will correspond to half the width of the strip-like element itself.

Page 20, lines 8-18, ~~amend~~ the paragraph, as follows:

D23

When the support element 22 comes close to the top of its stroke away from the geometric axis of rotation of the toroidal support 11, the movable carriage 21 is translated in its movement direction from left to right with reference to Fig. 2. Under this circumstance, the distributor element 22 moves in a direction substantially parallel to the geometric axis of rotation of the toroidal support 11 in such a manner that, in a position radially external to the latter, there is formation of a crown portion 23b of the deposition section 23 being made.

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Page 20, lines 19-24, ~~amend~~ the paragraph, as follows:

D24
When movable carriage 21 has substantially completed its translation stroke, the distributor element 22 is moved substantially radially close to the geometric rotation axis of the toroidal support 11. Under this circumstance, a second side portion 23c of the first deposition section 23 is formed.

Page 22, lines 6-18, ~~amend~~ the paragraph, as follows:

D25
The above-described operating sequence of the deposition apparatus 18 enables the crown portions 23b, 24b of each deposition section 23, 24 in the obtained carcass ply 3 to be disposed consecutively in side-by-side relationship along the circumferential extension of the toroidal support 11, whereas the side portions 23a, 23c, 24a, 24c of each deposition section 23, 24 are each disposed in superposition relationship with a side portion of at least one consecutive deposition section. More specifically, the first side portion 23a, 24a of each deposition section 23, 24 is partly superposed on the second side portion 23c, 24c of the previously formed deposition section 23, 24.

Page 23, lines 3-9, ~~amend~~ the paragraph, as follows:

D26
It is to note that, due to the difference between the minimum and maximum radii R and R' , the average density of the thread-like elements 13a, i.e., the amount of the thread-like

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D26
elements present in a circumferential section of given length, would have a tendency to progressively increase on moving close to the geometric rotation axis of the toroidal support 11.

Page 23, lines 13-18, ~~amend~~ the paragraph, as follows:

D27
However, in the tire made in accordance with the present invention, mutual superposition of side portions 23a, 24c and 24a, 23c actually gives rise to halving of the average density to be measured along the inner circumferential edges of the obtained carcass ply 3, i.e., at the bending regions 25.

Page 23, line 33 - page 24, line 7, ~~amend~~ the paragraph, as follows:

D28
If the presence of these empty spaces is to be avoided, so as to consequently obtain a maximum structural homogeneity of the carcass ply 3 close to the inner circumferential edges of the carcass ply 3, a pressing step is provided to be sequentially executed on the strip-like element 13 at the regions of its longitudinal extension corresponding to the side portions 23a, 23c, 24a, 24c, so as to define regions of increased width L' on the extension of the strip-like element, which regions are located at the inner circumferential edges of the formed carcass ply 3.

Page 24, lines 8-13, ~~amend~~ the paragraph, as follows:

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D29
Said pressing action can be carried out by a presser roller 29 mounted on the movable carriage 21, for example, and adapted to be selectively set in motion by an actuator 30 to press the strip-like element 13 against one of the rollers being part of the second guide members 20.

Page 24, lines 14-27, ~~amend~~ the paragraph, as follows:

D30
Actuator 30 is sequentially activated during deposition of the strip-like element 13, so as to cause crushing of same at the sections of longitudinal extension intended to form the side portions 23a, 23c, 24a, 24c. Thrust exerted by actuator 30 can be conveniently established in order to obtain an increasingly growing crushing action, for example, on moving close to the bending regions 25 and a progressively decreasing action on moving away therefrom. The crushing action causes a reduction in the thickness of the elastomeric layer 13b and an increase in the width of the strip-like element 13 which, as a result, will cause the thread-like elements 13a to move apart from each other.

Page 24, line 32 - page 25, line 11, ~~amend~~ the paragraph, as follows:

D31
By suitably inclining the orientation of the geometric axis of rotation of the toroidal support 11 relative to the movement direction of the movable carriage 21, the crown portions 23b, 24b of the deposition sections 23, 24 can be given a desired inclination, preferably included between 0° and 15°, and more preferably of about 3°, relative to a radial plane passing by the geometrical axis. It is also to note that, due to the rotation steps carried out by the toroidal

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D31
support 11 concurrently with the formation of each deposition section 23, 24, the side portions 23a, 23c, 24a, 24c of the deposition section will be inclined at an angle of $\delta/2$ relative to a radial plane crossing the side portions themselves, the first side portions 23a, 24a having an opposite inclination direction with respect to the second side portions 23c, 24c.

Page 26, lines 4-9, ~~amend~~ the paragraph, as follows:

D32
In a first embodiment shown in Figs. 1, 8, 15, 17, and 19, the inextensible annular insert 32 is located at an axially-outer position relative to the bead core 31. In other words, the annular insert 32 is located, with respect to the bead core 31, at a laterally-opposite position relative to the equatorial plane X-X.

Page 26, lines 10-16, ~~amend~~ the paragraph, as follows:

D33
In a possible alternative solution, shown in Fig. 18, the inextensible annular insert 32 is, on the contrary, located at an axially-inner position relative to the bead core 31, i.e., on the side facing the equatorial plane X-X. In this case, the annular insert 32 preferably substantially extends in contact with the adjacent carcass ply 3.

Page 26, line 30 - page 27, line 1, ~~amend~~ the paragraph, as follows:

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D34

Preferably, for accomplishment of each annular structure 4, first the inextensible annular insert 32 is formed within a molding cavity 34 defined in a mold 34a, 34b, by deposition of at least one thread-like element in concentric coils 32a disposed in mutual side-by-side relationship, according to circumferences of increasingly growing diameter about their geometric winding axis corresponding to the rotation axis of the tire.

Page 27, lines 2-6, ~~amend~~ the paragraph, as follows:

D35

This operation can be advantageously performed by winding the thread-like element in a helical seating arranged in a first cheek 34a of molding cavity 34 which, for the purpose, can be driven in rotation about its own geometric axis.

Page 27, line 28 - page 28, line 6, ~~amend~~ the paragraph, as follows:

D36

Preferably, filling of the molding cavity 34 is carried out by injecting the raw elastomer material through at least one annular injector comprising an admission opening or hollow space 35 substantially extending over the whole circumferential extension of the molding cavity. In this way, a quick and homogeneous filling of the molding cavity 34 occurs, without the risk of stratification phenomena that could arise in the elastomer material if the latter were obliged to pass through admission channels of reduced section. It is to note that the admission hollow space 35 may be comprised of a plurality of slits homogeneously distributed along the whole

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D36
circumferential extension of the molding cavity 34, so as to give rise, in any case, to a quick and homogeneous filling of the molding cavity.

Page 29, line 35 - page 30, line 4, ~~amend~~ the paragraph, as follows:

D37
Lengths 42 are individually and sequentially laid down onto the carcass structure 2 consecutively in a circumferential alignment and in mutual side-by-side relationship along respective junction edges 42a parallel to cords 36a and corresponding to the opposite longitudinal edges of the belt ribbon 36.

Page 30, lines 5-10, ~~amend~~ the paragraph, as follows:

D38
Therefore, the assembly of lengths 42 forms the first belt strip 6 of a continuous circumferential extension. As diagrammatically shown in Fig. 11, in the first belt strip 6 cords 36a will be disposed transversely at an inclination corresponding to the cutting inclination of lengths 42.

Page 30, lines 11-15, ~~amend~~ the paragraph, as follows:

D39
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Preferably, this inclination has a value corresponding to approximately 80° and, in any case, included between 45° and 90° relative to the circumferential extension direction, optionally with an opposite orientation relative to the underlying carcass ply 3.

Page 31, lines 18-22, ~~amend~~ the paragraph, as follows:

D40
Therefore, at least one second belt strip 7 is made, preferably by winding of at least one continuous elongated element 44 in the form of coils disposed axially in side-by-side relationship and extending circumferentially about the first belt strip 6.

Page 31, lines 23-28, ~~amend~~ the paragraph, as follows:

If required, the winding coils formed by the elongated element 44 can be disposed side-by-side in a variable axial-distribution pitch which, for instance, is greater close to the equatorial median plane X-X of the tire relative to the opposite side edges of the belt structure 5.

D41
Page 31, lines 29-34, amend the paragraph, as follows:

As diagrammatically shown in Fig. 12, for preparation of the continuous elongated element 44, one or more elementary cords 44a fed from corresponding reels 45 are parallelly joined together and rubberized by passage through a third extruder 46 supplied with elastomer material from a third extrusion apparatus 47.

Page 32, lines 9-16, amend the paragraph, as follows:

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D42

In more detail, these cords consist of a given number of strands, each strand being formed of a given number of individual wires of a diameter not lower than 0.10 mm and not higher than 0.40 mm, preferably included between 0.12 mm and 0.35 mm. Wires in the strands and strands in the cord are helically wound together in the same direction, the winding pitches for wires and strands being the same or even different.

[Page 32, lines 17-19, amend the paragraph, as follows:]

Preferably, these cords are made of high-carbon (HT) steel wires, i.e., containing carbon to an extent not lower than 0.9%.

Page 32, lines 33-36, ~~amend~~ the paragraph, as follows:

D43

In an alternative embodiment, specifically adopted with tires for cars, said winding is carried out with textile cords preferably of a heat-shrinkable material, such as NYLON 6 or NYLON 66, for example.

Page 33, lines 3-8, ~~amend~~ the paragraph, as follows:

D44

In more detail, according to a further aspect of the present invention, the tread band 8 is directly formed about the belt structure 5 by circumferential winding of at least one continuous

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D44
sheet of raw elastomer material 49 about the belt structure in a plurality of radially-superposed coils, as diagrammatically shown in Fig. 15.

Page 34, lines 12-22, ~~amend~~ the paragraph, as follows:

D45
The outer cheek 53a is first coupled with a first inner cheek (not shown) to define a first cavity within the mold, in which cavity, by injection of a first elastomer material, the radially outer portion 9a of the sidewall 9 is formed. The first inner cheek of mold 53 is then replaced by the second inner cheek, so shaped that, in the mold, a second cavity partly delimited by the previously-molded radially outer portion 9a is defined. This second seating is intended for receiving the radially-inner portion 9b, which is formed by injection of a second elastomer material.

Page 34, lines 26-29, ~~amend~~ the paragraph, as follows:

D46
Tire 1, thus manufactured, is now ready to be removed from the toroidal support 11 to be submitted to a vulcanization step that can be executed in any known and conventional manner.

Page 34, line 30 - page 35, line 6, amend the paragraph, as follows:

D47
According to a possible alternative embodiment, an air tube of closed tubular section may be advantageously associated with tire 1 in addition to, or in place of liner 10, before the

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D47
vulcanization step, which air tube is inserted into carcass structure 2 after the tire has been removed from the toroidal support 11. This air tube, not shown in the accompanying drawings, will be inflated after the tire has been introduced into a vulcanization mold to supply an inner pressure adapted to ensure a perfect adhesion of the tire against the mold walls and, in particular, against the mold parts intended for defining the longitudinal and transverse cuts 8a of the tread pattern.

Page 35, lines 20-27, ~~amend~~ the paragraph, as follows:

Actually, the tire in reference can be obtained through manufacture of the different components directly on a toroidal support on which the tire is gradually formed or, in any case, very close thereto. In this way, all problems connected with manufacture, storage, and management of semifinished products which are common to manufacturing processes of the traditional type are eliminated.

D48
[Page 35, line 28 - page 36, line 8, amend the paragraph, as follows:]

It is to note, in particular, that formation of the carcass ply or plies by deposition of a strip-like element formed of several cords incorporated into one elastomer layer enables important advantages to be achieved. First of all, in comparison with the method described in the above mentioned U.S. Patent No. 5,453,140, the manufacturing time for each carcass ply can be greatly reduced, due to the simultaneous deposition of as many thread-like elements as there

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are contained in the strip-like element 13. Employment of the strip-like element 13 also dispenses with the need for previously depositing liner 10 onto the toroidal support. Actually, the elastomer layer 13b employed in forming the strip-like element 13 is capable, by itself, to ensure an efficient adhesion of strip-like element 13 to the toroidal support 11, thereby ensuring a steady positioning of the individual deposition sections 23, 24.

D48
[Page 36, lines 9-20, amend the paragraph, as follows:]

Positioning accuracy, as regards the deposition sections and the thread-like elements integrated thereinto, is further improved by the fact that the strip-like element has an important structural consistency that makes it insensitive to vibrations or similar oscillation effects that can be transmitted by the deposition apparatus 18. In this connection, it is to note that deposition of an individual thread-like element, as described in U.S. Patent No. 5,453,140, makes it difficult to obtain an accurate deposition of each thread section, due exactly to vibrations and/or oscillations undergone by said thread during the deposition step.

[Page 36, lines 21-27, amend the paragraph, as follows:]

Furthermore, simultaneous deposition of a plurality of thread-like elements in accordance with the invention enables the deposition apparatus 18 to be operated at slower rates than required when deposition of the individual thread is concerned, which is a further advantage in terms of working accuracy without, on the other hand, impairing productivity.

Page 37, lines 1-6, ~~amend~~ the paragraph, as follows:

DK9
In addition to the above, the strip-like element can be steadily fastened to the toroidal support by a vacuum effect produced through possible holes 28, which steady fastening by vacuum cannot be achieved by known processes carrying out deposition of an individual thread.

Page 38, lines 6-19, ~~amend~~ the paragraph, as follows:

D50
As can be easily viewed from said figure, the presence of the inextensible annular insert 32 prevents the tire bead from rotating under the effect of the slip thrust N directed parallelly to the tire axis, turning on its resting point against the security hump 57 arranged in rim 54. Under this situation, the slip thrust N, transmitted along the carcass ply 3 until close to the bead core 31, gives rise to a radial component N_1 , which tends to move the bead away from the bead seat 55 and is counteracted by the circumferential inextensibility of the annular structure 4, as well as to an axial component N_2 , tending to push the bead against the circumferential flange 56, ensuring maintenance of a steady positioning of same.

IN THE CLAIMS:

Please ~~amend~~ claims 39, 46, and 76-80; as follows:

D51
39. (twice amended) A method of making a tire, comprising:
making a carcass structure;

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